14. (Twice Amended) A shiny aluminum vehicle wheel comprising, a single-piece, unitary aluminum wheel, fabricated by a method as defined in claim 1, wherein said pinholes in said polished surface of the casting after being polished have a dimension of not more than 2.0 mm diameter and are not more than 15 per 100 cm^2 area in quantity; wherein said polished surface has a roughness R_{max} of not more than 1.6 μm; and wherein the shinny aluminum vehicle wheel comprises a surface-treated layer, including a resin coating layer with a thickness of not less than 10 μm and not more than 40 μm formed as an undercoat on said polished surface, a dry-tape plating layer made of a metal or a metal compound formed on said resin coating layer and a transparent topcoat layer formed on said dry-tape plating layer so as to provide a design surface.

15. (Once Amended) A shiny single-piece, unitary aluminum vehicle wheel as described in claim 14, wherein said aluminum material is aluminum.

16. (Once Amended) A shiny single-piece, unitary aluminum vehicle wheel as described in claim 14, wherein said aluminum material is an aluminum alloy.

REMARKS

Claims 1-16 are pending in the application. By this Amendment, Applicants have amended claims 1 and 14 without introducing new matter.

Claim Rejections – 35 USC §103

Claims 1-7, 9 and 11-16 are rejected under 35USC §103(a) as being unpatentable over Prieto in view of Sakoda, and further in view of Kaumle. Claim 8 is rejected under 35 USC §103(a) as being unpatentable over Prieto modified by Sakoda and Kaumle, and further in view

of Ohtani. Claim 10 is rejected under 35USC §103(a) as being unpatentable over Prieto modified by Sakoda and Kaumle, and further in view Nishimura. Applicants respectfully traverse all rejections and provide the following comments and arguments.

Applicants have amended claims 1 and 14 to include the step of casting encompassing an auxiliary pressurizing step for applying, by a pressurizing pin, a pressurizing force to the molten metal of the material filled in a die cavity. This is in addition to an application of casting pressure during a solidification process of the molten metal.

None of the cited references disclose, teach or suggest an auxiliary pressurizing step using a pressurizing pin performed during the high-pressure casting.

Claim 1, directed to a method for fabricating a light-metal casting, comprises four correlated steps. The first step is a high-pressure casting step for casting a single piece, light-metal part by applying a casting pressure of more than about 50 megapascal to a molten metal of a light-metal material, to form a casting having pin holes in a casting surface, the generation of the pin holes being suppressed to meet a pre-determined condition. The first step includes an auxiliary step for applying, by a pressurizing pin, a pressurizing force to the molten metal, in addition to the application of the casting pressure, during a solidification process of the molten metal. The second step is a polishing step for polishing the casting to reduce a roughness of the casting surface to form a polished surface with a roughness R_{max} not more than a pre-determined value. The third step includes painting the polished casting to form a resin coating layer on the polished surface. The fourth step is a dry-type plating step for plating the painted casting to form a metal or metal-compound layer on a surface of the resin coating layer.

Claim 14, directed to a shiny aluminum vehicle wheel, possesses substantially the same characteristic features as defined in claim 1. The inventors of the present case have found that the first high-pressure casting step, including the auxiliary pressurizing step, remarkably and significantly improves the condition of the polished surface of the casting, obtained by the subsequent second step, in relation, particularly, to the number and size of pin holes remaining in the polished surface. This is supported in the specification on page 20, line 20 through page 21, line 21, and table 1 on page 22. The claimed method conspicuously reduces the number of pinholes, especially in the large-size group (Φ0.5 or more) as well as in the distant-area group (B3: spaced away from a gate 18 of a die 12). Due to this significant improvement of the polished surface condition, the subsequent third and fourth steps become effective to provide a gloss surface of the casting having a good performance, such as a superior anti-chipping performance as described in the specification (page 21, lines 4-6). This remarkable effect is not anticipated or expected, by a person skilled in the art, on the basis on the descriptions of the cited references.

Prieto teaches a method for manufacturing a one-piece cast wheel, but does not teach a high-pressure casting including the auxiliary pressurizing step as the first step of the invention. Also, Prieto does not teach or suggest performing the second to fourth steps of the invention after casting the wheel. That is, Prieto teaches none of the steps of the invention.

Sakoda teaches a high-pressure casting of a two or three-piece vehicle wheel, wherein a molten metal filled in a mold is solidified under a pressure of 500 kgf/cm^2 or higher. In this respect, the examiner indicated in the office action that, "Sakoda teaches that if casting is performed at pressures less than 500 kgf/cm^2, the cast aluminum is likely to crack, shrink, and exhibit reduced mechanical performance (page 4, lines 36-40)". However, the indicated

sentences describe problems particular to the new aluminum alloy presented as an invention in Sakoda, which is defined as being particularly suitable for the two or three-piece wheel. Also, Sakoda does not teach or suggest performing the second or fourth steps of the invention after casting the wheel. Sakoda only teaches the benefits of the high-pressure casting when the new aluminum alloy is cast to form a wheel disc (i.e., one part of the wheel), and thus, there is no motivation for a person skilled in the art to combine Sakoda with Prieto for improving the polished surface condition of the casting, obtain by a polishing step as defined in the claimed method. Of course, Sakoda does not teach or suggest an auxiliary pressurizing step using a pressurizing pin performed during the high-pressure casting.

Kaumle teaches a gloss coating method useful in gloss coating vehicle wheels, one embodiment which includes a mechanical smoothening step, a coating step and metalizing step. However, Kaumle is fully silent about any casting process of an article to be coated. Also, Kaumle is silent about the condition of the smoothened surface obtained by the smoothening step of the above embodiment, and thus, it could not be realized from Kaumle whether problems exist in the smoothened surface, which may be solved by the claimed fabricating method of the present case. Therefore, there is no motivation for a person skilled in the art to combine Kaumle with Prieto and/or Sakoda, for the purpose of improving the smoothened or polished surface condition of the cast article.

Neither Ohtani nor Nishimura teach or suggest the characterizing correlative four steps of the claimed fabricating method of the present case.

For reasons provided above, applicants respectfully submit that the four-step fabricating method claimed in this invention is not taught or suggested from any combination of

the cited references. The inventive method is characterized by the correlation and cooperation between these claimed four steps, for significantly improving the polished surface condition of the casting, which is not obvious from the cited references. There is no motivation to combine the references, and thus the Examiner's obviousness rejection appears to be based on hindsight.

Definitions

The Examiner has interpreted "light metal" to mean "aluminum, or aluminum alloy". The phrase "light metals" has a broader meaning in the art. "Light metals" can be defined as metals and alloys that have a low specific gravity such as beryllium, magnesium and aluminum, but not limited thereto. Applicants attach definitions from www.principalmetals.com and www.steelmill.com.

The Examiner interprets "dry plating" to mean "sputtering, vacuum evaporation, and ion plating". Applicant did not intend to limit the phrase "dry plating" to the aforementioned techniques. Applicant intends "dry-plating to include any plating methods designated as such by those skilled in the art. A few additional examples include, plasma plating and various types of electroplating.

Applicants respectfully submit that the claims as amended herein are patentable over the combination of any of the references cited. Withdrawal of the obviousness rejection, and allowance of all pending claims is, therefore, respectfully requested.

Respectfully submitted,
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AMENDMENT

(Copy Showing Changes)

1. (~~Once~~ Twice Amended) A method for fabricating a light-metal casting, comprising the steps of:

casting a single piece light metal part by applying a casting pressure of more than about 50 megapascal from an ejection plunger to a molten metal of a light-metal material poured into a die, to form a casting having pinholes generated in a casting surface, wherein the generation of pinholes is suppressed to meet a predetermined condition;

polishing the casting to reduce a roughness of ~~a polished surface obtained by polishing~~ said casting surface to form a polished surface with a roughness R_{max} not more than a predetermined value;

painting the ~~polished~~ casting after being polished to form a first resin coating layer on said polished surface ~~after being polished~~; and

plating said ~~painted~~ casting after being painted to form a layer of a metal or a metal compound through a dry-type plating on a surface of said first resin coating layer~~.~~;

wherein said step of casting includes an auxiliary pressurizing step for applying, by a pressurizing pin, a pressurizing force to said molten metal of said light-metal material filled in a die cavity, in addition to an application of said casting pressure, during a solidification process of said molten metal under said casting pressure.

2. (Once Amended) The method as described in claim 1, wherein the predetermined condition of the pinholes generated on said polished surface is that the number and a maximum opening dimension of the pinholes generated in a predetermined area of the polished surface is not more than a predetermined value.

3. (Once Amended) The method as described in claim 2, wherein the number of said pinholes is in the range of 1 to 15 per 100 cm^2 of said polished surface and said maximum opening dimension is not more than 2 mm.

4. (Once Amended) The method as described in claim 3, wherein that the number of said pinholes is in the range of 1 to 10 per 100 cm^2 of said polished surface, said maximum opening dimension is not more than 2 mm and the number of the pinholes having the maximum opening dimension of 1.0 to 2.0 mm is one or zero.

5. (Once Amended) The method as described in claim 1, wherein roughness of said polished surface obtained by said polishing step is 6.3 μm in R_{max}.

6. (Once Amended) The method as described in claim 1,wherein said first resin coating layer is not less than 10 μm and not more than 40 μm thick.

7. (Once Amended) The method, as described in claim 1, wherein a transparent second resin coating layer is formed on said metal or metal compound layer.

8. (Once Amended) The method as described in claim 7, wherein each of said first and second resin coating layers includes a primer coating layer.

9. (Once Amended) The method as described in claim 7, wherein said transparent second resin coating layer is not less than 20 μm and not more than 50 μm thick.

10. (Once Amended) The method as described in claim 1, wherein said polishing step is a barrel finishing process.

11. (Once Amended) The method as described in claim 1, wherein said plating step for forming a layer of a metal or a metal compound through said dry-type plating is a sputtering process.

~~12. (Once Amended) The method as described in claim 1, wherein said casting step includes a pressurizing step for applying, by a pressurizing pin, a pressurizing force to a predetermined portion of the molten metal of said light-metal material filled in a die cavity during a solidification process of said molten metal under high pressure.~~

13. (Once Amended) The method as described in claim 1, wherein said casting of said light-metal material is an aluminum wheel.

14. (~~Once~~ Twice Amended) A shiny aluminum vehicle wheel comprising, a single-piece, unitary aluminum wheel, ~~cast by a high-pressure casting process, in which a molten metal of an aluminum material filled in a cavity of a die for casting a vehicle wheel is pressurized by an ejection plunger and in a solidification process of the molten metal, a thick portion of the cavity is pressurized by a pressurizing pin arranged in the die,~~ fabricated by a method as defined in claim 1, wherein said pinholes ~~generated~~ in ~~a~~ said polished surface of the ~~aluminum~~ casting after being polished have a dimension of not more than 2.0 mm diameter and are not more than 15 per 100 cm^2 area in quantity; wherein said polished surface has a roughness R_{max} of not more than 1.6 μm; and wherein the shinny aluminum vehicle wheel comprises a surface-treated layer ~~wherein the casting~~

~~surface is a barrel-polished to form a polished surface with a roughness Rmax of not more than 1.6 μm~~, including a resin coating layer with a thickness of not less than 10 μm and not more than 40 μm ~~is~~ formed as an undercoat on ~~an~~ said polished surface, a dry-tape plating layer made of a metal or a metal compound ~~is~~ formed on said resin coating layer and a transparent topcoat layer ~~is~~ formed on said dry-tape plating layer so as to provide a design surface.

15. (Once Amended) A shiny single-piece, unitary aluminum vehicle wheel as described in claim 14, wherein said aluminum material is aluminum.

16. (Once Amended) A shiny single-piece, unitary aluminum vehicle wheel as described in claim 14, wherein said aluminum material is an aluminum alloy.